PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-5

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2014 Fisheries Management Survey Report

Lake Texana

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Texana were surveyed in 2014 using trap netting and electrofishing and in 2015 using gill netting. Historical data are presented with the 2014-2015 data for comparison. This report summarizes the results and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Lake Texana is a 9,727-acre reservoir, controlled by the Lavaca-Navidad River Authority (LNRA), located on the Navidad River in the Lavaca River Basin, approximately 20 miles east of Victoria, Texas. It receives water from the Navidad River, Sandy Creek, and Mustang Creek and is used for water supply and recreation. Water level typically fluctuates 2-4 feet annually but has fluctuated as much as 12 feet.

  Management History: Important sport fish species include Blue and Channel catfishes, White Bass, Largemouth Bass, and White and Black crappies. Management strategies from the 2011 management plan focused on promoting the fisheries and assisting LNRA with vegetation control, marking navigational channels, and informing the public about non-native species in the reservoir. Herbicide treatments are conducted annually by LNRA staff and hired contractors. The Texas Parks and Wildlife Department (TPWD) assisted as consultants for vegetation control and as a funding source.

- **Fish Community**
  - **Prey species:** Gizzard and Threadfin shads were abundant in the reservoir and were the predominant forage group. Bluegill were the predominant sunfish species and relative abundance decreased from the last report. Overall, forage species were small enough to be consumed by most predatory species and abundant enough to support healthy sportfish populations.

  - **Catfishes:** Blue, Channel, and Flathead catfishes were present in the reservoir with Blue Catfish being the predominant species. Blue Catfish abundance and size structure was excellent and this species provides a good angling opportunity.

  - **White Bass:** Gill net catch rate of White Bass in 2015 decreased from the 2011 sample. However, anecdotal information suggested the White Bass were farther upstream than our sample sites. Anglers reported White Bass were numerous and often exceeding 12-inches in length.

    Largemouth Bass: The Largemouth Bass electrofishing catch rate was the highest in over 14 years. The population had a good balance of size classes and there was an increase in the number of legal-sized fish collected. This correlates with an increase in vegetation abundance and successful stockings. Average age of 14-inch Largemouth Bass was 2.3 years.

  - **Crappie:** Overall trap net catch rates of Black and White crappies decreased from the previous survey but catch rates of legal-size fish were similar. Despite this decrease, the majority of both populations were comprised of sublegal-sized fish, indicating adequate spawning success and survival. White Crappie reached 10-inches by age 2.

- **Management Strategies:** Continue to manage fisheries under current regulations, continue to work with the LNRA on exotic aquatic vegetation control, write and distribute press releases concerning the fisheries, and fabricate and install artificial habitat structures.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Texana in 2014-2015. The purpose of the document is to provide fisheries information and provide management recommendations to protect and improve the sport fishery. This report deals primarily with major sport fishes and important prey species. Management recommendations address existing problems or opportunities. Historical data are presented with the 2014-2015 data for comparison.

Reservoir Description

Lake Texana is a 9,727-acre reservoir, controlled by the Lavaca-Navidad River Authority (LNRA), and located on the Navidad River in the Lavaca River Basin, approximately 20 miles east of Victoria. It receives water from the Navidad River and Sandy and Mustang creeks and is used for water supply and recreation. Water level typically fluctuates 2-4 ft annually but has fluctuated as much as 12 feet (Figure 1). Substrate was composed primarily of clays, deep loams, and saline soils. Littoral habitat consisted of several native aquatic vegetation species (American pondweed, coontail, American lotus, cattail, and bulrush) and standing timber. Exotic aquatic vegetation species present included hydrilla, water hyacinth, giant salvinia, alligator weed, and trace amount of parrot feather. The lake is windswept and generally turbid throughout the year; however, clear water can be found in coves with dense stands of submersed vegetation. Other reservoir characteristics for Lake Texana can be found in Table 1.

Angler Access

Lake Texana has ten public ramps and no private boat ramps (Table 2). Additional boat ramp characteristics are in Table 2. Shoreline access was excellent and available at all public boat ramp sites. Additionally, one fishing pier was available to shoreline anglers at Texana Park. Access for the physically challenged was adequate with ample shoreline access and the one fishing pier.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Findeisen and Binion 2011) included:

1. Continue to assist LNRA with the control of water hyacinth and giant salvinia on the reservoir.
   Action: District staff annually reviewed and provided comment on vegetation treatment proposals submitted for the chemical treatment of water hyacinth and giant salvinia.

2. Work with LNRA staff on marking river and creek channels to improve navigation and safety.
   Action: District staff met with LNRA staff to discussed the deployment of navigational buoys to mark creek and river channels. LNRA had numerous telephone poles available and opted to use them to permanently mark the creek and river channels in the most dangerous sections of the reservoir. Low water conditions needed to accomplish the project were met in 2011; however, the reservoir refilled before the project began. The project is still open and work will begin when water level drops to the desired level.

3. District staff proposed to write and distribute press releases regarding the population increases of most regulated fishes in Lake Texana.
   Action: Press releases regarding the White Bass, catfish, crappie, and Largemouth Bass population increases were written and distributed to local and statewide media outlets.

4. Work closely with LNRA staff on educating the public about the non-native aquatic plant species found in Lake Texana. These plants include hydrilla, water hyacinth, alligator weed, and giant salvinia.

    Action: District staff provided LNRA staff with signs to post at boat ramps and provided LNRA staff with electronic copies of brochures to be printed and posted at local bait stores and gas stations. Additionally, LNRA staff painted "Stop Zebra Mussels. Clean, Drain, and Dry Your Boat. It's the Law." on all the public boat ramps to remind boaters of necessary precautions to avoid spreading non-native species.

Harvest regulation history: Sport fish in Lake Texana are currently managed with statewide regulations (Table 3).

Stocking history: Stockings since the previous report included Channel Catfish in 2012 and Florida Largemouth Bass in 2013 and 2014. A complete stocking history is in Table 4.

Vegetation/habitat management history: Water hyacinth and giant salvinia are problematic species and can be found throughout the entire reservoir. Both water hyacinth and giant salvinia are treated annually with herbicides by LNRA. Approximately 1,000,000 giant salvinia weevils were released by TPWD between 2002 and 2005. Hydrilla and several native aquatic vegetation species have continued to expand in the reservoir as a result of vegetation control efforts on water hyacinth and giant salvinia. Historically, hydrilla has always been present in the reservoir but was only problematic shortly after the reservoir filled. At that time grass carp were released in the reservoir for hydrilla control. Approximately 700,000 hydrilla flies were released by TPWD in 2005 to control hydrilla around the Navidad River boat ramp.

Water transfer: Lake Texana is primarily used for water supply and recreation. Currently, there are two permanent pumping stations on the reservoir that transfer water to other locations. Both stations are operated by the LNRA. One pumping station provides water to the local municipal and industrial water users and the other pumping station provides water to the city of Corpus Christi via the Mary Rhodes Pipeline. Annual inter-basin transfer of 41,840 acre-feet water occurs through the Mary Rhodes Pipeline to O.N. Stevens water treatment plant in Corpus Christi. The city of Corpus Christi may make two additional requests for water, the first for 4,500 acre-feet and the second for 7,500 acre-feet. These additional requests will only be granted if several criteria are met including the city of Corpus Christi having storage capacity for the water and Lake Texana is at or above 43 feet above mean sea level (one foot below conservation pool).

METHODS

Fishes were collected using electrofishing (1.5 hours at 18, 5-minute stations), trap netting (10 net nights at 10 stations) and gill netting (10 net nights at 10 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour of actual electrofishing (fish/h) and for trap and gill nets as the number of fish caught in one net set overnight (fish/nn). All stations were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2014).

A structural habitat survey was last conducted in 2006. Vegetation surveys were conducted every four years from 2006-2014 to monitor abundance and distribution of both native and non-native aquatic vegetation. Both habitat and vegetation were assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2014). All vegetation control activities were conducted by LNRA.

Sampling statistics (CPUE for various length categories) and structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et el. 2007], and condition indices [relative weight indices (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard Error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all catch statistics. Largemouth Bass and crappies were aged using otoliths.

Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2014). Micro-satellite DNA analysis was used to determine genetic composition of individual fish in 2010 and 2014 and by electrophoresis for previous years.

Source for water level data was the United States Geological Survey (USGS 2015).

RESULTS AND DISCUSSION

Habitat: Shoreline habitat consisted of natural shoreline, concrete, cut bank, and gravel. Littoral zone and near shore habitat consisted of hydrilla, giant salvinia, water hyacinth, alligator weed, American lotus, coontail, American pondweed, water stargrass, and standing timber. Results of the complete littoral zone habitat/vegetation survey are in Table 5. Native submersed vegetation increased in coverage in 2014 (762.6 acres) as compared to 57.8 acres in 2006 and 203.3 acres in 2010 and native floating-leaved vegetation in 2014 (185.3 acres) was between the estimates in 2006 (76.6 acres) and 2010 (282.2 acres) (Table 6). Estimates of Alligator Weed decreased from 394.1 acres in 2010 to 48.3 acres in 2014 (Table 6). Giant salvinia, hydrilla, and water hyacinth estimates all increased from the two previous surveys (Table 6). Maps from the 2014 digital shapefile vegetation survey can be found in Appendices C and D.

Prey species: The 2014 electrofishing CPUE for Gizzard Shad was 190.7/h, higher than in 2006 (145.0/h) and 2010 (104.7/h; Figure 2). The Gizzard Shad IOV from 2006-2014 was in the 90s, indicating more than 90% of the Gizzard Shad were less than 8 inches in length and vulnerable to predation. The 2014 electrofishing CPUE for Threadfin Shad was 671.3/h, substantially higher than previous years (Figure 3).

The 2014 electrofishing CPUE for Bluegill was 88.7/h, substantially higher than in 2006 (12.5/h) but lower than in 2010 (142.0/h) (Figure 4). Size structure (PSD) of Bluegill was low, indicating the majority of the Bluegill ranged from 3.0-5.9 inches in length. All sunfishes were of size available to most predators. Bluegill and other sunfish do not provide a fishery as few fish ≥ 6 inches were present in the reservoir.

Blue Catfish: The 2015 gill net CPUE for Blue Catfish was 10.4/nn, steadily declining from 2007 (18.0/nn) and 2011 (14.3/nn) (Figure 5). The 2015 gill net survey took two weeks to complete due to high instream flows delaying setting nets in riverine sites of the reservoir. This may explain the slight decrease in Blue Catfish CPUE. Mean relative weights of Blue Catfish stock size and longer were good; with most inch groups averaging near or above 90. Legal-sized Blue Catfish (≥12-inches) comprised at least half of total number of Blue Catfish collected in all three gill net surveys. Quality-sized (≥ 20-inches total length) and preferred-sized (≥ 30-inches total length) Blue Catfish were represented in all three gill net surveys. Blue Catfish were the predominant catfish species in this reservoir and provided anglers with adequate numbers and larger-sized fish.

Channel Catfish: The 2015 gill net CPUE for Channel Catfish was 0.9/nn, similar to the 2006 (0.3/nn) and 2011 (1.0/nn) catch rates (Figure 6). The number of legal-sized Channel Catfish (≥ 12-inches) increased slightly. Historically, gill net CPUEs of Channel Catfish have been near or below 1.0/nn. This may be indicative of a small Channel Catfish population or the ineffectiveness of using gill nets to monitor Channel Catfish. Baited hoop nets surveys have provided higher catch rates for Channel Catfish on other reservoirs within the district and will be included in the future survey methodology for this reservoir.

White Bass: The 2015 gill net CPUE for White Bass was 0.1/nn, substantially lower than in 2011 (7.5/nn) and the same as in 2007 (0.1/nn) (Figure 7). The decrease in White Bass gill net CPUE is attributed to sampling too far downstream in the creeks and rivers while the White Bass were making their annual spawning run. Anecdotal information from anglers encountered fishing in the rivers and creeks suggested the White Bass were farther upstream than our sample sites. These same anglers reported catching numerous legal-sized White Bass ($\geq$ 10-inches total length) with many of the fish exceeding 12-inches. Historically, White Bass reach legal size ($\geq$10-inches) by age 1 (Findeisen and Binion 2011).

Largemouth Bass: The 2014 electrofishing CPUE for Largemouth Bass was 52.7/h, higher than the CPUE in 2006 (2.0/h) but similar to the CPUE in 2010 (40.0/h) (Figure 9). Mean relative weights for Largemouth Bass were excellent; averaging near or above 100 for all length classes and indicated forage was readily available. The 2014 CPUE of legal-sized Largemouth Bass (CPUE-14; 9.3/h) was higher than in 2006 (0.0/h) and 2010 (3.3/h), indicating adequate growth and recruitment to legal size. Mean age at legal size (14-inches) was 2.3 years with a range of 2-4 years of age. The PSD value in 2010 (56) and 2014 (64) indicate a balanced population. Well timed stockings in combination with increased littoral zone habitat, especially submersed vegetation, likely increased survival and attributed to the higher Largemouth Bass relative abundance in 2010 and 2014. Despite the stockings of Florida Largemouth Bass, pure Florida Largemouth Bass genetics remained below 10%. Largemouth Bass genetic composition data can be found in Table 7.

White Crappie: The 2014 trap net CPUE for White Crappie was 19.0/nn, between the CPUEs in 2006 (7.4/nn) and 2010 (35.4/nn) (Figure 10). Proportional Size Distribution and CPUE-10 were similar to previous years. In 2014, White Crappie reached 10-inches by age 2 (Figure 11). Age and growth data from 2010 and 2014 were primarily comprised of two year classes of White Crappie $\leq$ age 2 (Figure 11). All four of these strong year classes occurred in years when reservoir water level increased within six months of the spawn. The 2013 White Crappie year class was not well represented in the age and growth sample and correlates to a decrease in reservoir water level shortly after the spawn (Figure 11).

Black Crappie: The 2014 trap net CPUE of Black Crappie was 0.9/nn, similar to the CPUE in 2006 (0.4/nn) but less than in 2010 (3.4/nn) (Figure 12). Two legal-sized (10-inches) Black Crappie were collected in 2014.

Fisheries management plan for Lake Texana, Texas

Prepared - July 2015.

ISSUE 1 Water hyacinth and giant salvinia continue to create access problems on Lake Texana and prohibit the colonization and growth of submersed aquatic vegetation utilized by centrarchid species. LNRA has conducted herbicide treatments on the reservoir resulting in the colonization and growth of submersed aquatic vegetation in a few areas.

MANAGEMENT STRATEGIES

1. Continue to provide support for LNRA on control of water hyacinth and giant salvinia.

2. When available, obtain and release new biological control agents from USDA for water hyacinth and giant salvinia control.

3. Monitor hydrilla for expansion and colonization in new areas.

ISSUE 2 Largemouth Bass, Blue Catfish, White Bass, and crappie populations continue to provide anglers with good fishing opportunities.

MANAGEMENT STRATEGY

1. Highlight these fisheries through writing and distributing press releases to local and statewide media outlets.

ISSUE 3 Lake Texana's water level fluctuations have the potential to be detrimental to sportfish populations by leaving habitat dry during critical times of the year, such as immediately after spawning.

MANAGEMENT STRATEGY

1. Work with LNRA staff on identifying areas where artificial reefs could be deployed to provide fish habitat in times of low water level.

2. Work with LNRA staff on constructing and deploying artificial reef structures in the identified areas.

3. Prepare a georeferenced map for anglers identifying artificial reef structures.

ISSUE 4: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. Giant salvinia (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc… so that they can in turn educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes tandem hoop netting, electrofishing and trap netting in 2018 and gill netting in 2019 (Table 8). Monitoring surveys are only necessary every four years at this point to ensure presence or absence of Largemouth Bass, Blue and Channel catfishes, White Bass, and crappies.

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Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional size distribution (PSD): A further refinement of population size structure index terminology. Fisheries 32(7):348.

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Quarterly Surface Water Level

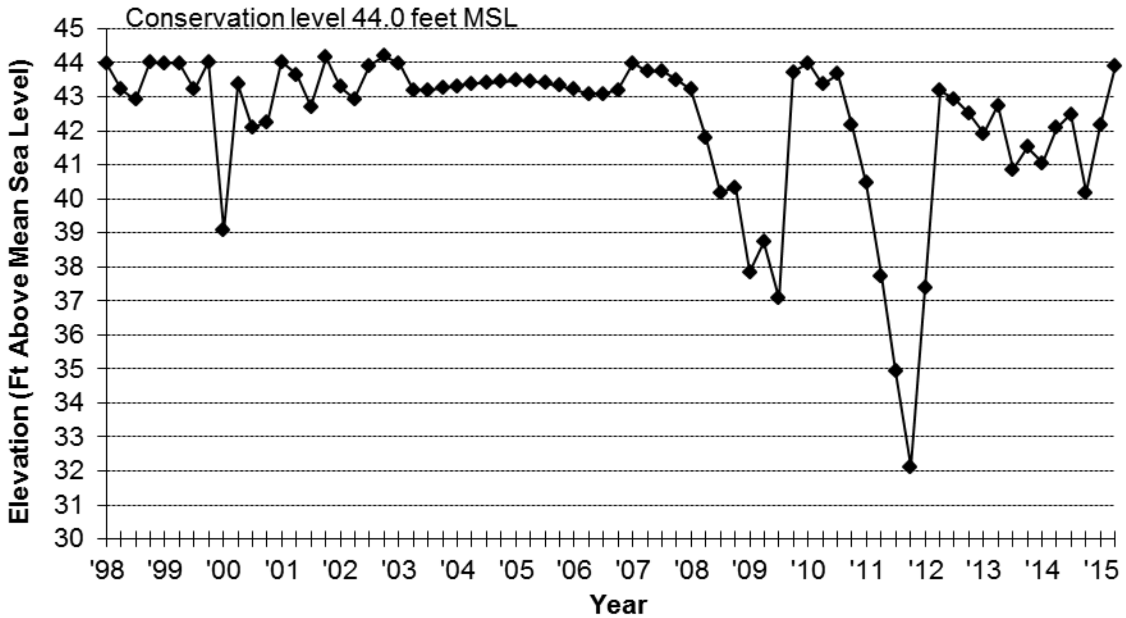


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Lake Texana Reservoir, Texas.

Table 1. Characteristics of Lake Texana, Texas.

Characteristic	Description
Year constructed	1980
Controlling authority	Lavaca-Navidad River Authority
County	Jackson
Reservoir type	Mainstem
Shoreline Development Index	8.0
Conductivity	180-300 umhos/cm
Access: Boat	Good, 10 boat ramps
Bank	Adequate, at boat ramps, 1 pier
Handicapped	Adequate, LNRA parks

Table 2. Boat ramp characteristics for Lake Texana, Texas, August, 2014. Reservoir elevation at time of survey was 40 feet above mean sea level. Elevation at end of boat ramp were obtained from LNRA.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Navidad River	29.021898 -96.569487	Y	20	30.0	Excellent, no access issues
Sandy Creek	29.025246 -96.549257	Y	20	34.0	Excellent, no access issues
Highway 1157	29.043054 -96.468154	Y	10	37.0	Excellent, no access issues
Mustang Creek	29.025507 -96.506774	Y	20	30.0	Excellent, no access issues
Mustang Wilderness	28.999084 -96.529738	Y	20	27.0	Excellent, no access issues
County Rd 237	28.973117 -96.523905	Y	10	35.0	Excellent, no access issues
Texana Park	28.956662 -96.539403	Y	20	32.0	Excellent, no access issues
Highway 111	28.951105 -96.517503	Y	20	33.5	Excellent, no access issues
Brackenridge Park	28.936576 -96.543630	Y	20	31.0	Excellent, no access issues
Simons Rd	28.914002 -96.568454	Y	20	28.5	Excellent, no access issues

Table 3. Harvest regulations for Lake Texana, Texas.

Species	Bag Limit	Length Limit
Gar, Alligator	1	No minimum length
Catfish: Channel and Blue, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5	14-inch minimum
Crappie: White and Black, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Lake Texana, Texas. Size categories are FRY = fry, FGL = fingerling, ADL = adults, and UNK = unknown or unrecorded size.

Year	Number	Size
	Threadfin Shad	
1980	7,900	UNK
	Rainbow Trout	
1993	2,009	ADL
	Blue Catfish	
1994	300	ADL
	Channel Catfish	
1980	285,646	UNK
1994	500	ADL
2012	106,229	FGL
Species total	392,375	
	Striped Bass	
1981	1,981,000	UNK
1982	1,365,507	UNK
1983	375,000	UNK
1984	1,189,600	FRY
1987	60,050	FGL
1988	700,000	FRY
1989	618,237	FRY
Species total	6,289,394	
	Palmetto Bass	
1996	82,500	FGL
1997	165,081	FGL
1998	165,500	FGL
1999	82,789	FGL
Species total	495,870	
	Florida Largemouth Bass	
1979	5,000	FGL
1980	102,629	FGL
1981	553,678	FGL
1994	245,783	FGL
2006	489,326	FGL
2007	486,494	FGL
2013	485,671	FGL
2014	503,667	FGL
Species total	2,872,248	
	Triploid Grass Carp	
1989	15,294	ADL
1990	96	ADL
1991	26	ADL
Species total	15,416	

Table 5. Survey of structural habitat types, Lake Texana, Texas, 2006. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Boat dock	0.3	0.2
Boulder	<0.1	<0.1
Bulkhead	0.6	0.4
Concrete	2.8	1.8
Natural	148.1	95.0
Rip rap	2.5	1.6
Rocky/gravel	1.9	1.2
Standing timber	795.0	8.2

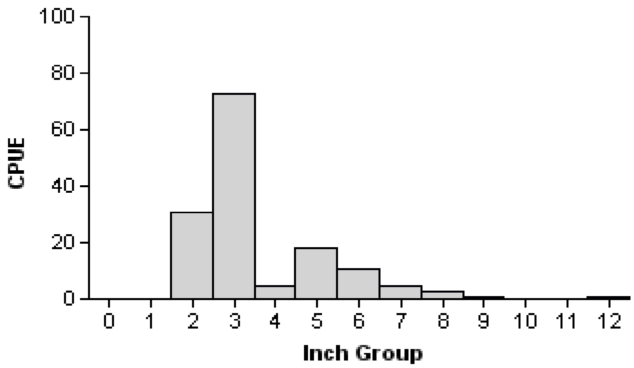
Table 6. Survey of aquatic vegetation, Lake Texana, Texas, 2006, 2010, and 2014. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2006	2010	2014
Native submersed	57.8 (0.6%)	203.3 (2.1%)	762.6 (7.8%)
Native floating-leaved	76.6 (0.8%)	252.2 (2.6%)	185.3 (1.9%)
Flooded terrestrial vegetation	219.3 (2.3%)	None	None
Non-native			
Alligator weed		394.1 (4.1%)	48.3 (0.5%)
Giant salvinia	768.9 (7.9%)	160.9 (1.7%)	818.8 (8.4%)
Hydrilla	609.6 (6.3%)	607.3 (6.2%)	973.8 (10.0%)
Water hyacinth	928.9 (9.5%)	1169.0 (12.0%)	1510.9 (15.5%)

Gizzard Shad

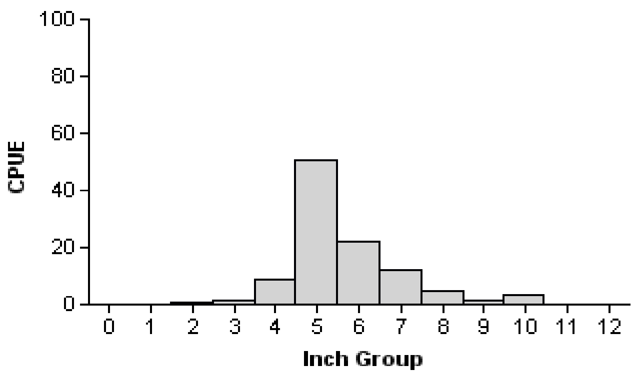
2006

Effort = 2.0
Total CPUE = 145.0 (36; 290)
IOV = 98 (1)



2010

Effort = 1.5
Total CPUE = 104.7 (26; 157)
IOV = 91 (3)



2014

Effort = 1.5
Total CPUE = 190.7 (21; 286)
IOV = 99 (1)

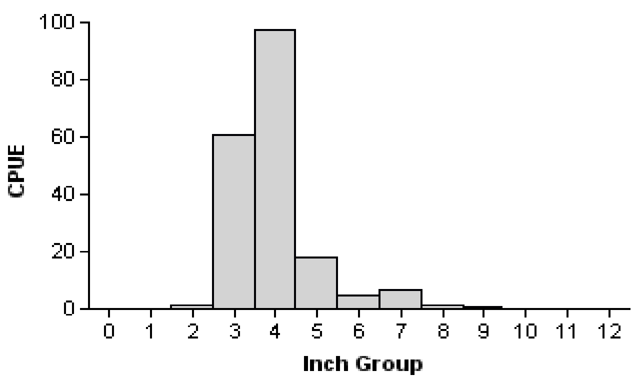


Figure 2. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Texana, Texas, 2006, 2010, and 2014.

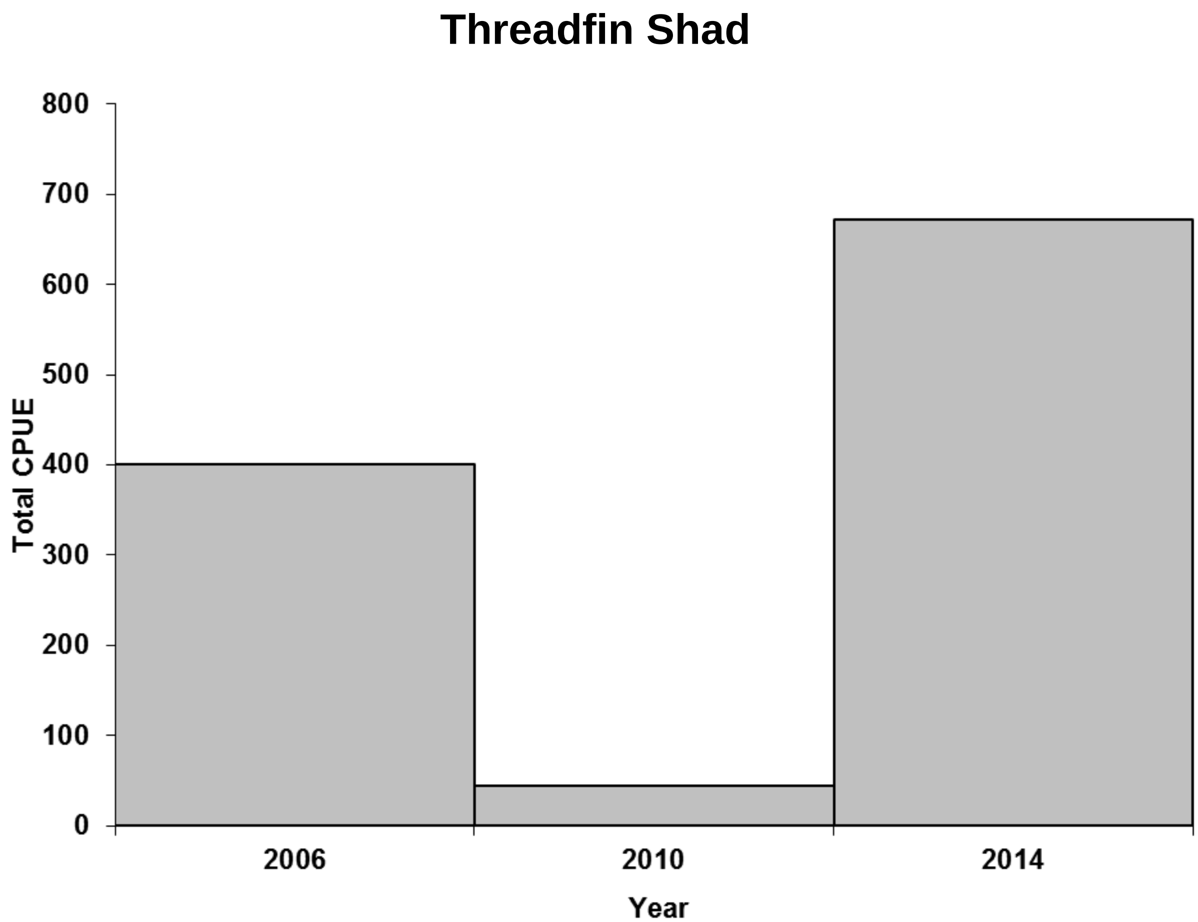
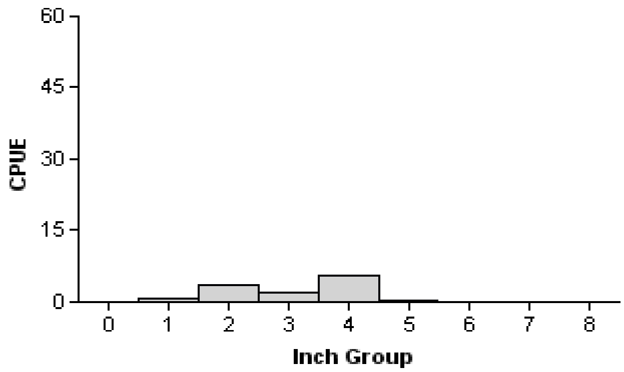


Figure 3. Total catch per unit effort for Threadfin Shad for fall electrofishing surveys, Lake Texana, Texas, 2006, 2008, and 2014. Sampling effort was 24, 5-minute stations for 2006 and 18, 5-minute stations for 2010 and 2014.

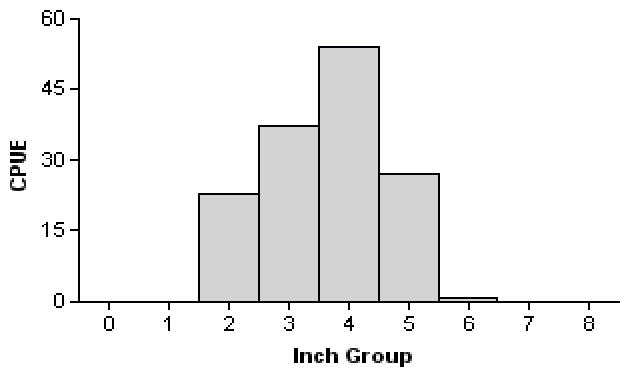
Bluegill

2006



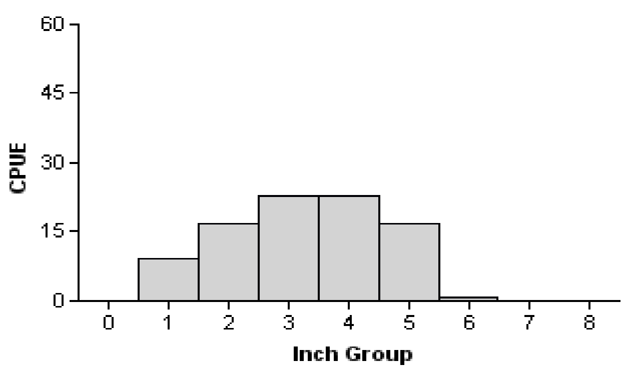
Effort =	2.0
Total CPUE =	12.5 (45; 25)
PSD =	0 (78)

2010



Effort =	1.5
Total CPUE =	142.0 (31; 213)
PSD =	1 (1)

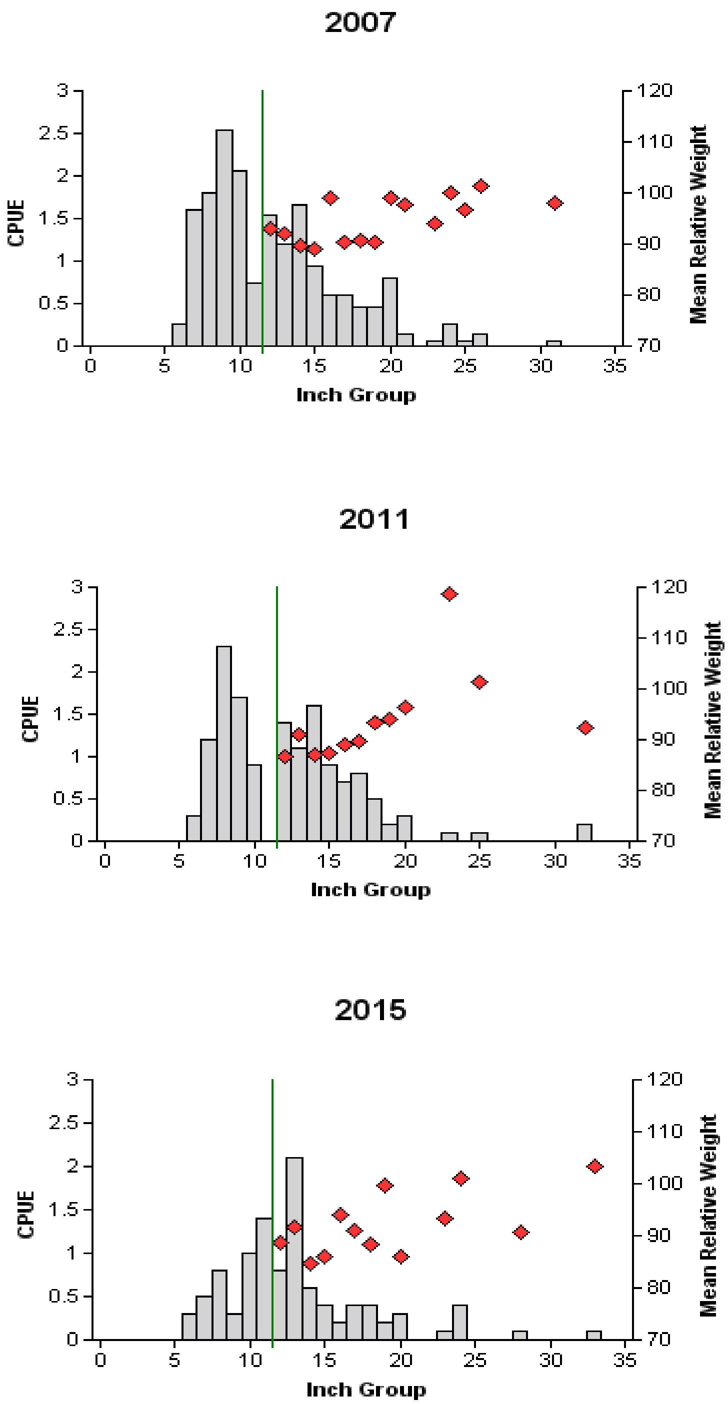
2014



Effort =	1.5
Total CPUE =	88.7 (23; 133)
PSD =	1 (1)

Figure 4. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Texana, Texas, 2006, 2010, and 2014.

Blue Catfish



Effort =	15.0
Total CPUE =	18.0 (30; 270)
Stock CPUE =	9.0 (29; 135)
CPUE-20 =	1.5 (33; 23)
PSD =	17 (2)

Effort =	10.0
Total CPUE =	14.3 (26; 143)
Stock CPUE =	7.9 (20; 79)
CPUE-20 =	0.7 (48; 7)
PSD =	9 (5)

Effort =	10.0
Total CPUE =	10.4 (26; 104)
Stock CPUE =	6.1 (26; 61)
CPUE-20 =	1.0 (33; 10)
PSD =	16 (4)

Figure 5. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Lake Texana, Texas, 2007, 2011, and 2015. Vertical line denotes 12-inch minimum length limit.

Channel Catfish

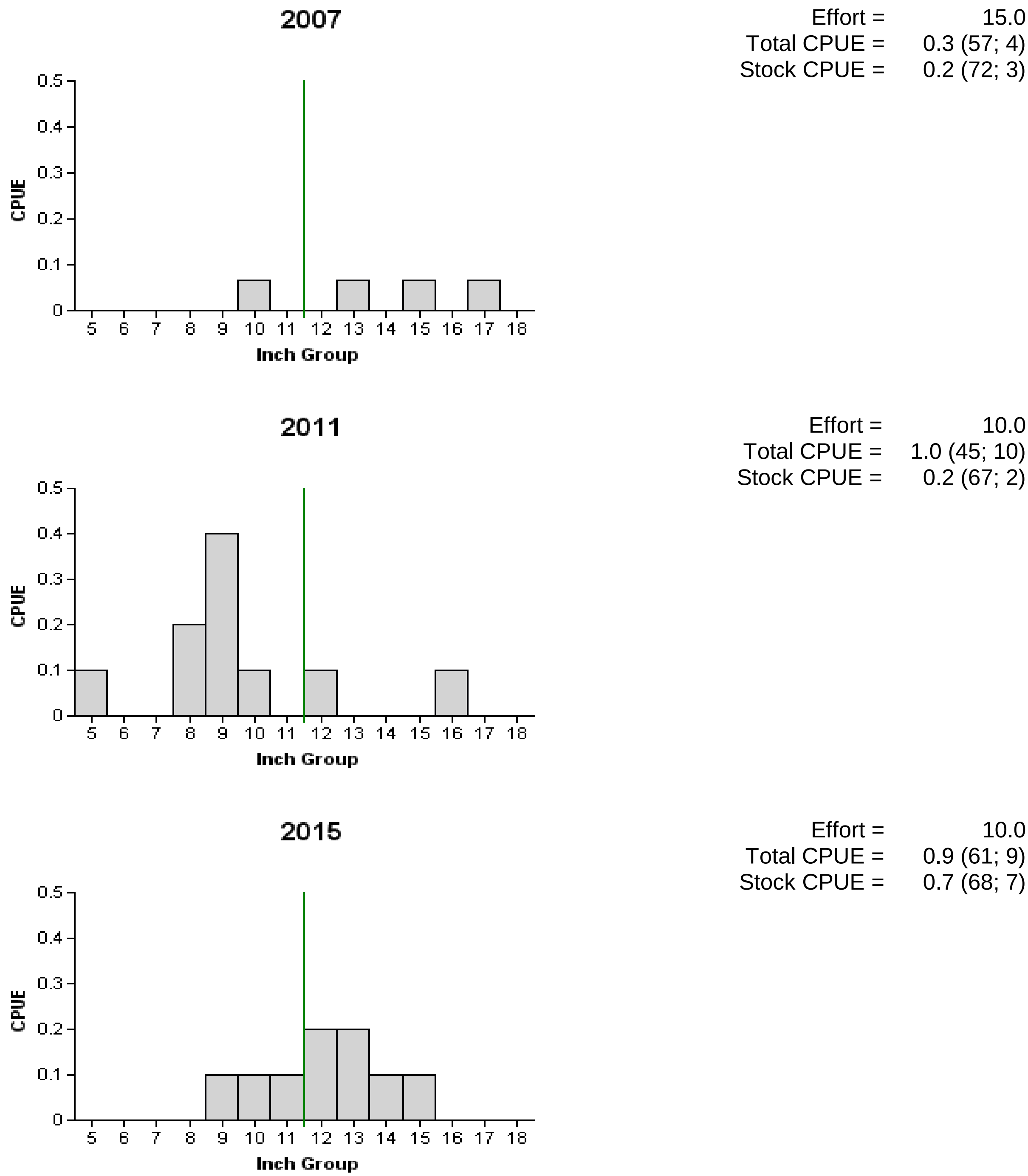
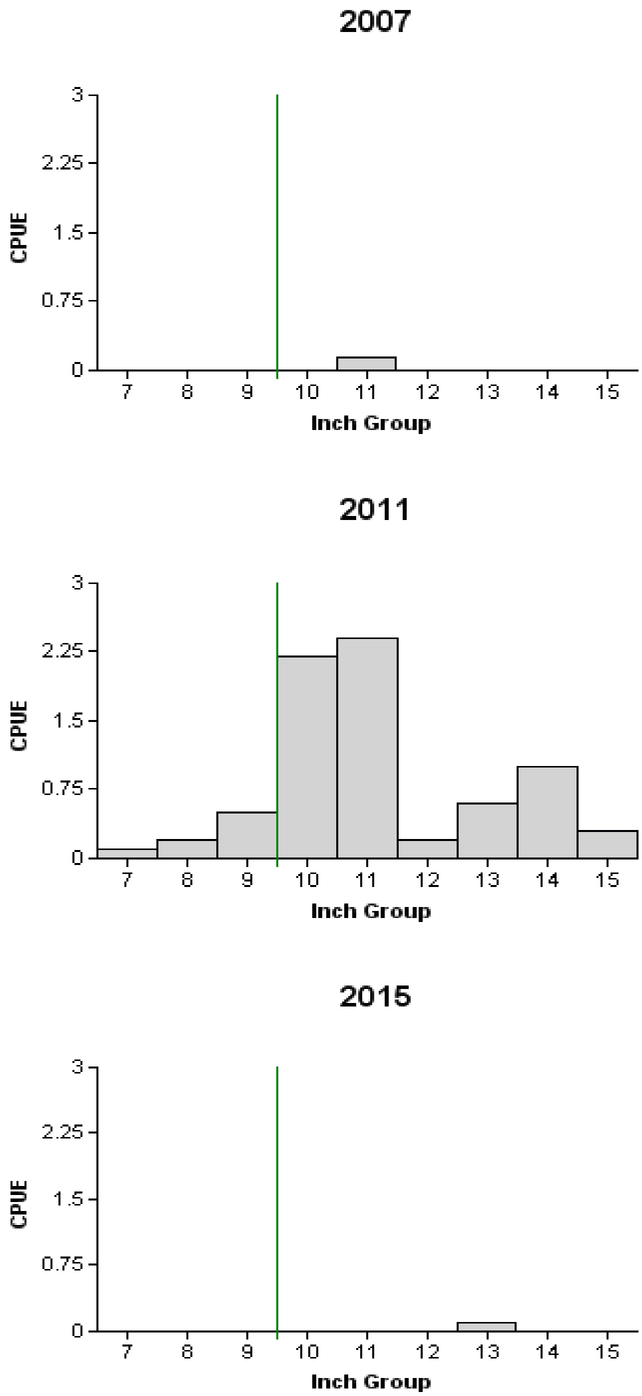


Figure 6. Number of Channel Catfish caught per net night (CPUE, bars), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) or spring gill netting surveys, Lake Texana, Texas, 2007, 2011, and 2014. Vertical line denotes 12-inch minimum length limit.

White Bass



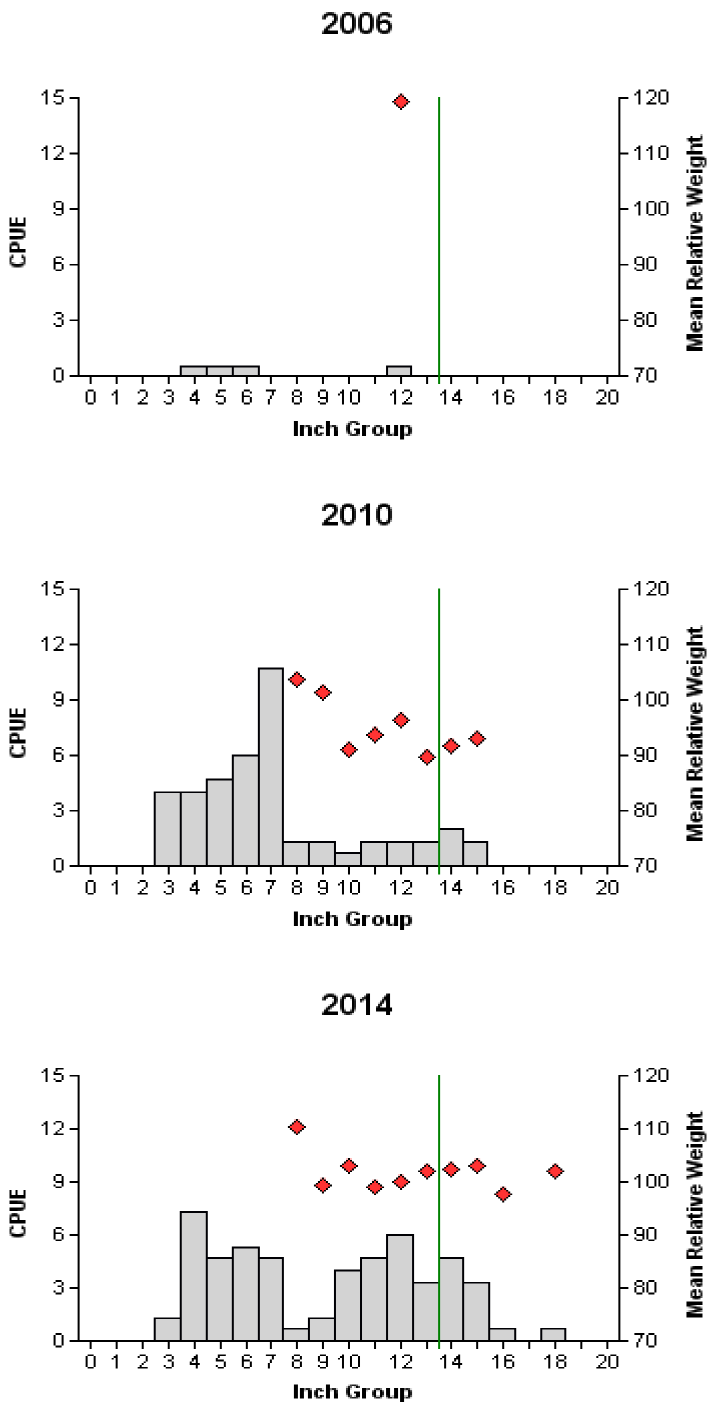
2007
Effort = 15.0
Total CPUE = 0.1 (68; 2)
CPUE-10 = 0.1 (68; 2)

2011
Effort = 10.0
Total CPUE = 7.5 (33; 75)
CPUE-10 = 6.7 (37; 67)

2015
Effort = 10.0
Total CPUE = 0.1 (100; 1)
CPUE-10 = 0.1 (100; 1)

Figure 7. Number of White Bass caught per net night (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Lake Texana, Texas, 2007, 2011, and 2015. Vertical line denotes 10-inch minimum length limit.

Largemouth Bass



2006

Effort =	2.0
Total CPUE =	2.0 (100; 4)
Stock CPUE =	0.5 (100; 1)
CPUE-14 =	0.0 (0; 0)
PSD =	100 (0)

2010

Effort =	1.5
Total CPUE =	40.0 (23; 60)
Stock CPUE =	10.7 (52; 16)
CPUE-14 =	3.3 (70; 5)
PSD =	56 (14)

2014

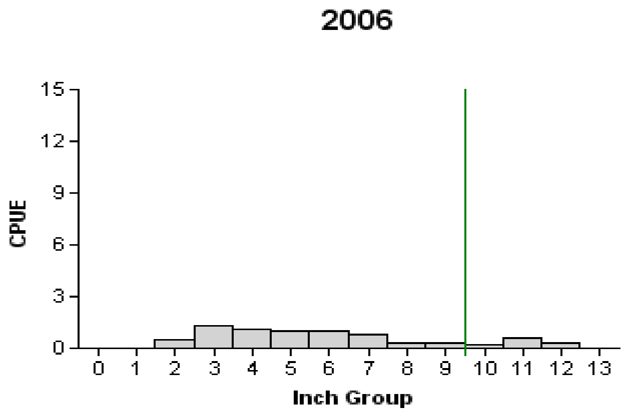
Effort =	1.5
Total CPUE =	52.7 (27; 79)
Stock CPUE =	29.3 (31; 44)
CPUE-14 =	9.3 (32; 14)
PSD =	64 (9)

Figure 9. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Texana, Texas, 2006, 2010, and 2014. Vertical line denotes 14-inch minimum length limit.

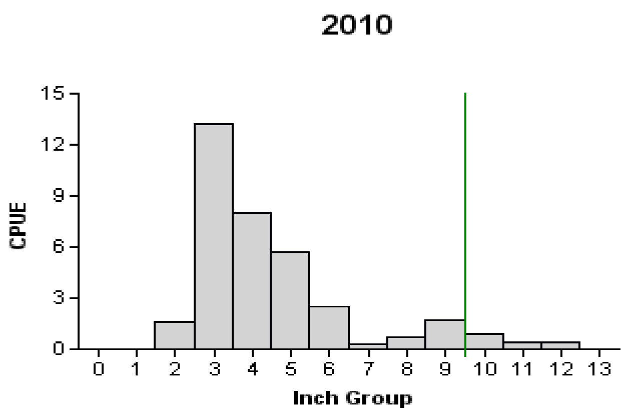
Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Lake Texana, Texas, 1999, 2010, and 2014. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

		Number of fish				
Year	Sample size	FLMB	Integrade	NLMB	% FLMB alleles	% FLMB
1999	28				63	17.9
2010	30	1	29	0	57	3.3
2014	30	2	28	0	61	6.7

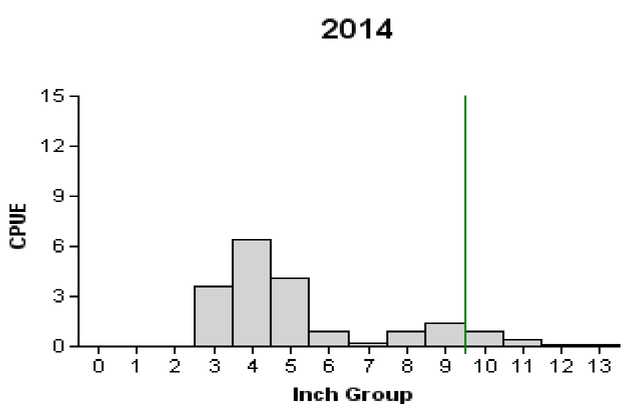
White Crappie



Effort =	15.0
Total CPUE =	7.4 (32; 111)
Stock CPUE =	4.5 (34; 67)
CPUE-10=	1.1 (41; 16)
PSD =	37 (8)



Effort =	10.0
Total CPUE =	35.4 (39; 354)
Stock CPUE =	12.6 (33; 126)
CPUE-10 =	1.7 (29; 17)
PSD =	33 (6)



Effort =	10.0
Total CPUE =	19.0 (41; 190)
Stock CPUE =	9.0 (39; 90)
CPUE-10 =	1.5 (46; 15)
PSD =	42 (9)

Figure 10. Number of White Crappie caught per net night (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Lake Texana, Texas, 2006, 2010, and 2014. Vertical line denotes 10-inch minimum length limit.

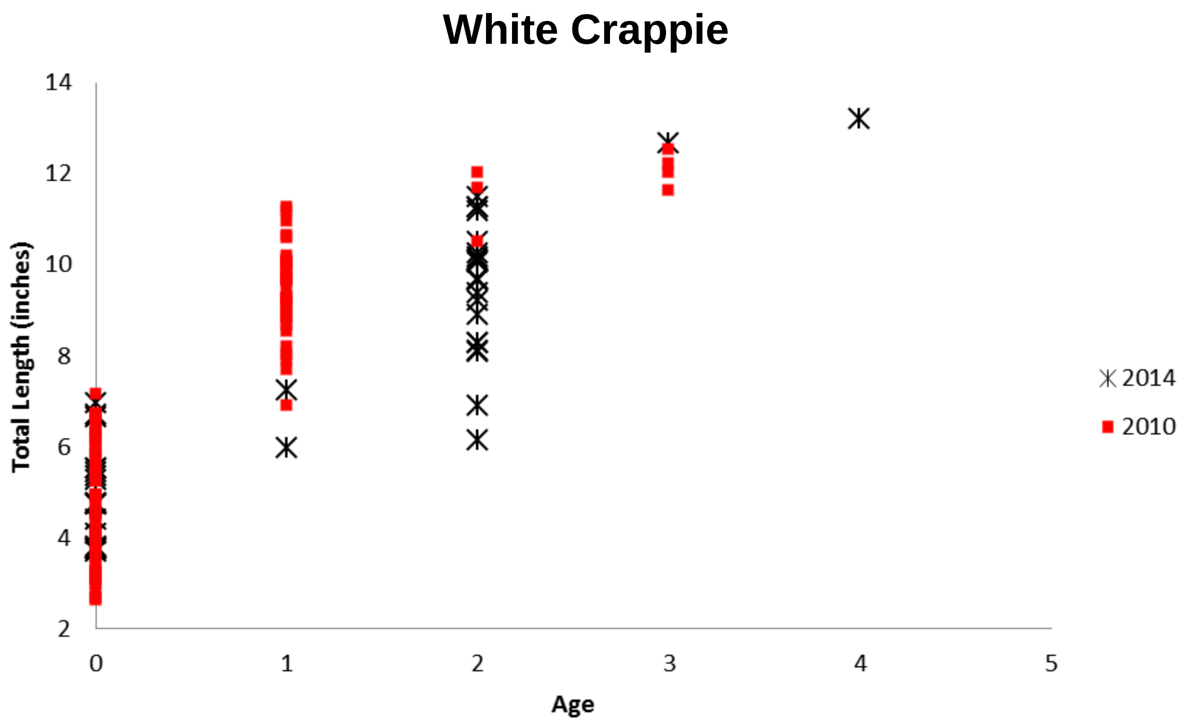
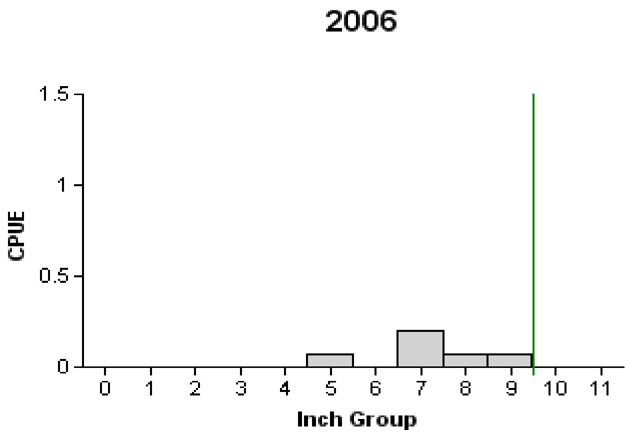
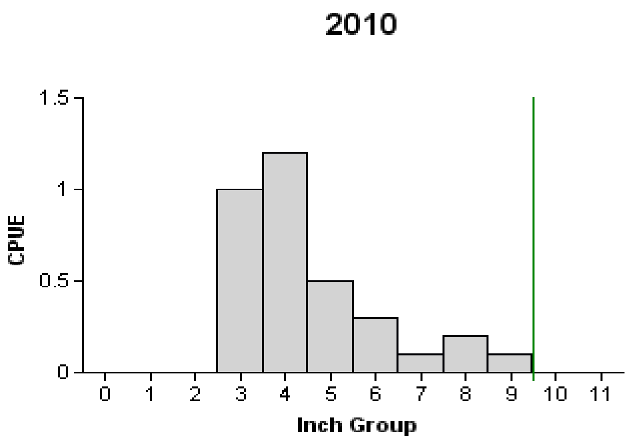


Figure 11. Length at age for White Crappie collected from trap nets at Lake Texana, Texas, November 2010 (N=100) and December 2014 (N=43).

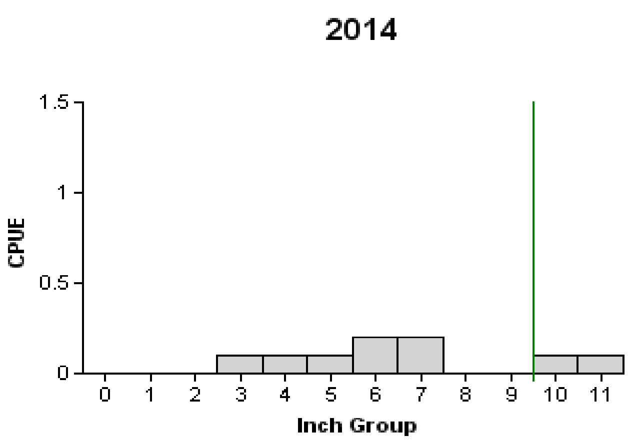
Black Crappie



Effort = 15.0
Total CPUE = 0.4 (53; 6)
Stock CPUE = 0.4 (53; 6)
CPUE-10 = 0.0 (0; 0)



Effort = 10.0
Total CPUE = 3.4 (38; 34)
Stock CPUE = 1.2 (44; 12)
CPUE-10 = 0.0 (0; 0)



Effort = 10.0
Total CPUE = 0.9 (56; 9)
Stock CPUE = 0.7 (57; 7)
CPUE-10 = 0.2 (67; 2)

Figure 12. Number of Black Crappie caught per net night (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Lake Texana, Texas, 2006, 2010 and 2014. Vertical line denotes 10-inch minimum length limit.

Table 8. Proposed sampling schedule for Lake Texana, Texas. Electrofishing and trap net surveys are conducted in the fall, hoop net surveys conducted in the summer, while gill net surveys are conducted in the spring. Standard surveys are denoted by S.

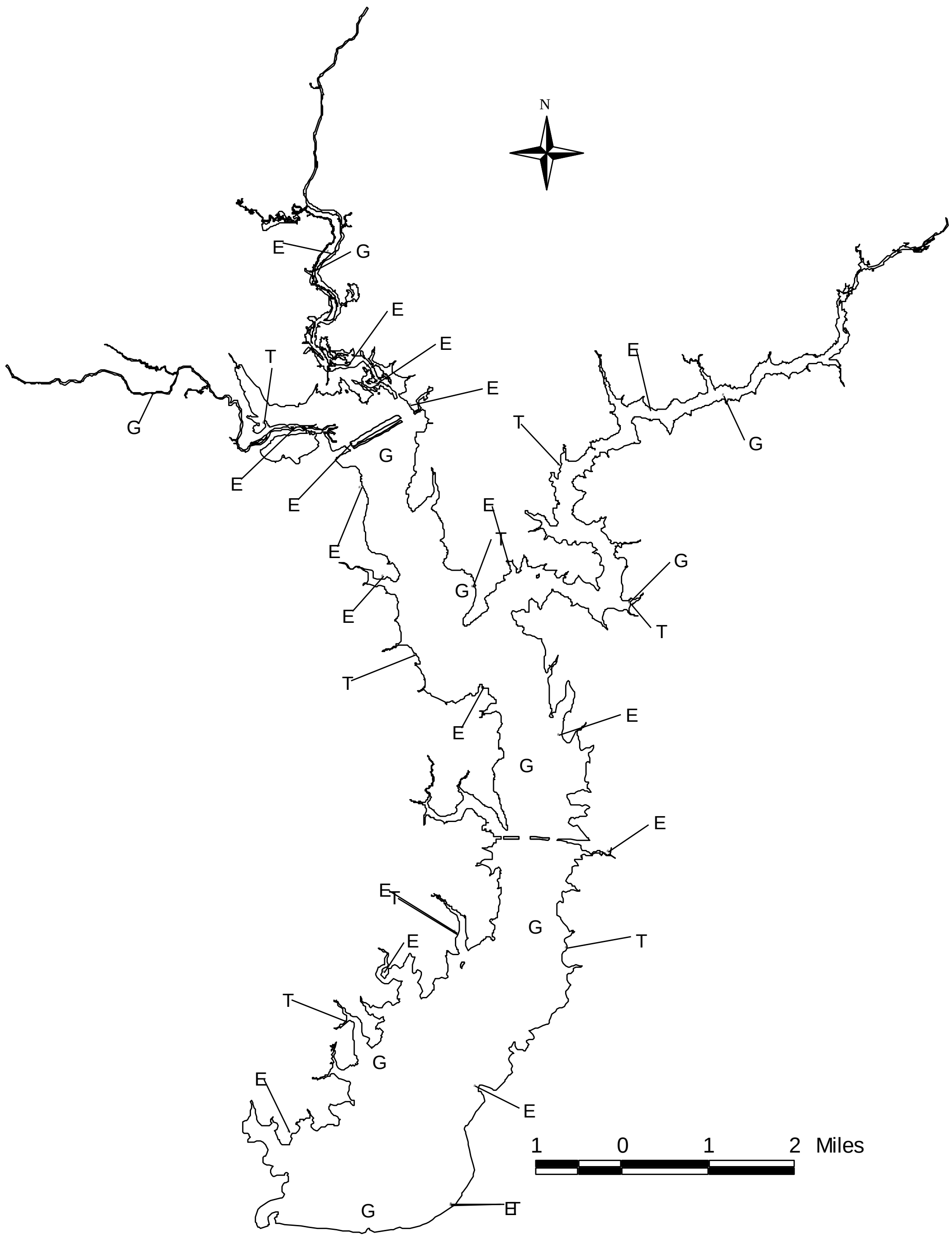
					Habitat				
Survey year	Hoop net	Electrofish Fall(Spring)	Trap net	Gill net	Structural	Vegetation	Access	Creel survey	Report
2015-2016									
2016-2017									
2017-2018									
2018-2019	S	S	S	S		S	S		S

APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from Lake Texana, Texas, 2014-2015. Sampling effort was 1.5 hour for electrofishing, 10 net nights for trap netting, and 10 net nights for gill netting.

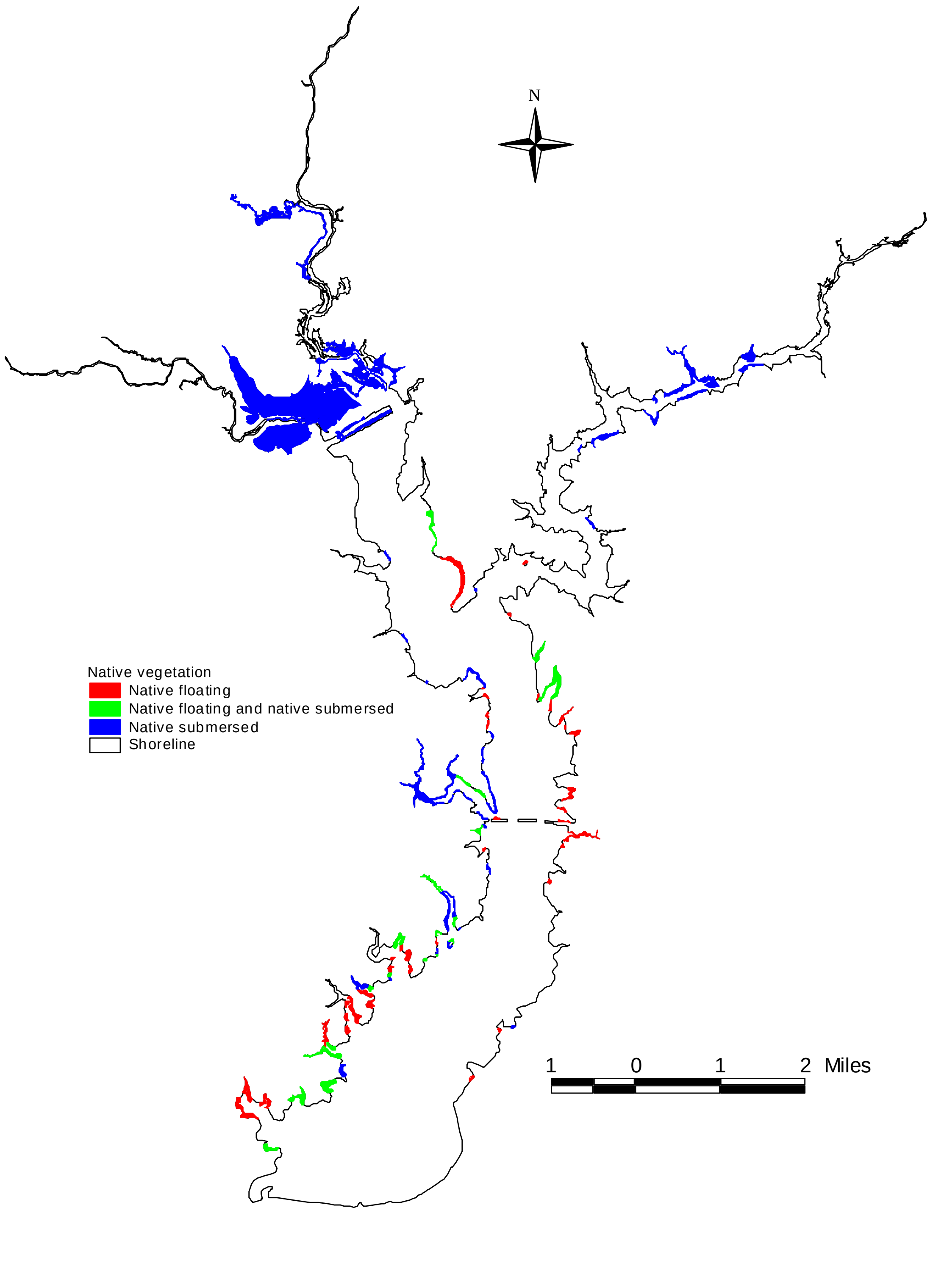
Species	Electrofishing		Trap Netting		Gill netting	
	N	CPUE	N	CPUE	N	CPUE
Spotted Gar					23	2.3
Longnose Gar					16	1.6
Gizzard Shad	286	190.7	39	3.9	13	1.3
Threadfin Shad	1,007	671.3	10	1.0		
Smallmouth Buffalo					24	2.4
Blue Catfish					104	10.4
Channel Catfish			1	0.1	9	0.9
White Bass	4	2.7			1	0.1
Warmouth	3	2.0				
Bluegill	133	88.7	39	3.9		
Longear Sunfish	22	14.7	3	0.3		
Redear Sunfish	6	4.0				
Largemouth Bass	79	52.7			1	0.1
White Crappie			190	19.0	10	1.0
Black Crappie			9	0.9		
Freshwater Drum			3	0.3	63	6.3

APPENDIX B



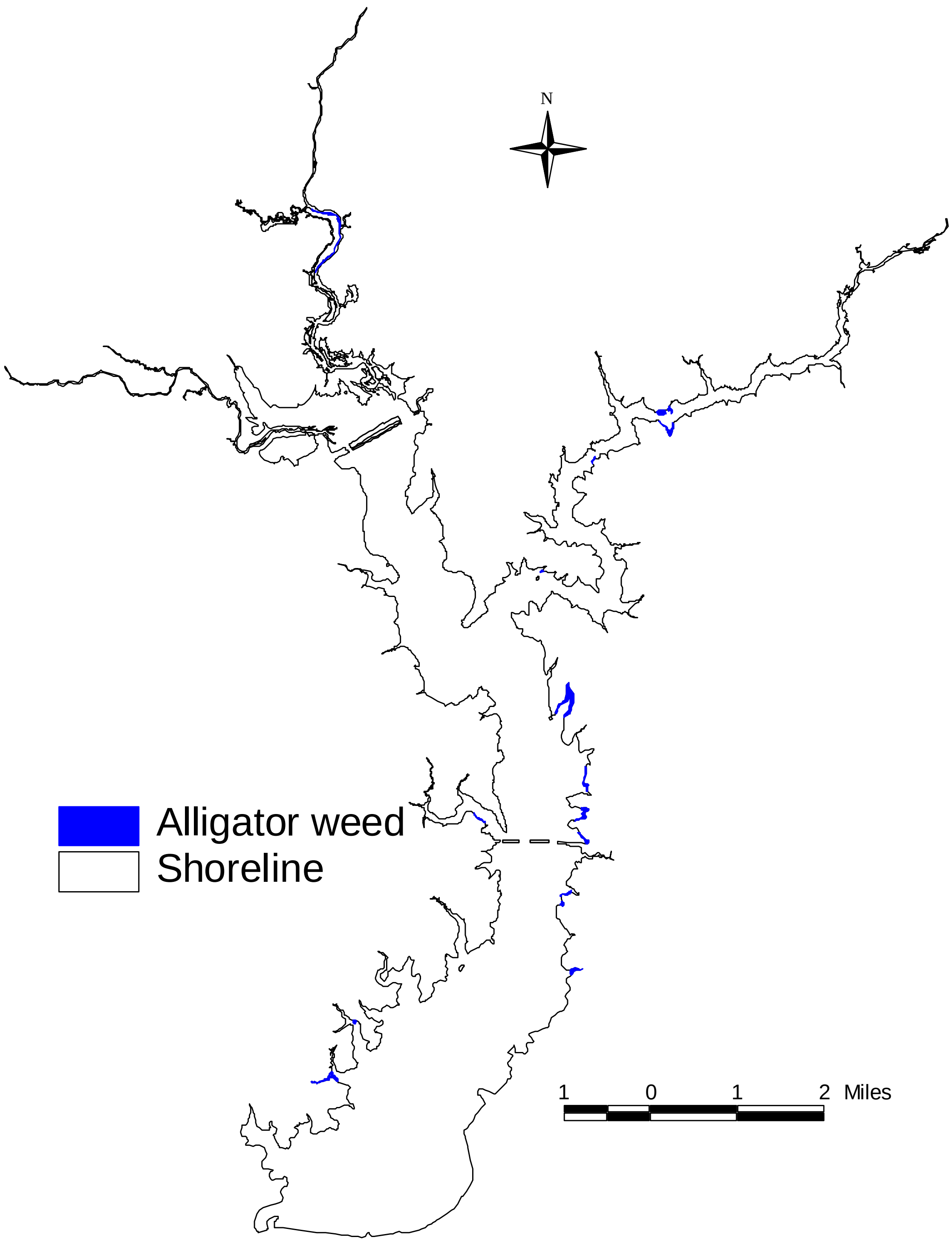
Location of sampling sites, Lake Texana, Texas, 2014-2015. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was 2 – 4 ft below conservation pool at time of sampling.

APPENDIX C

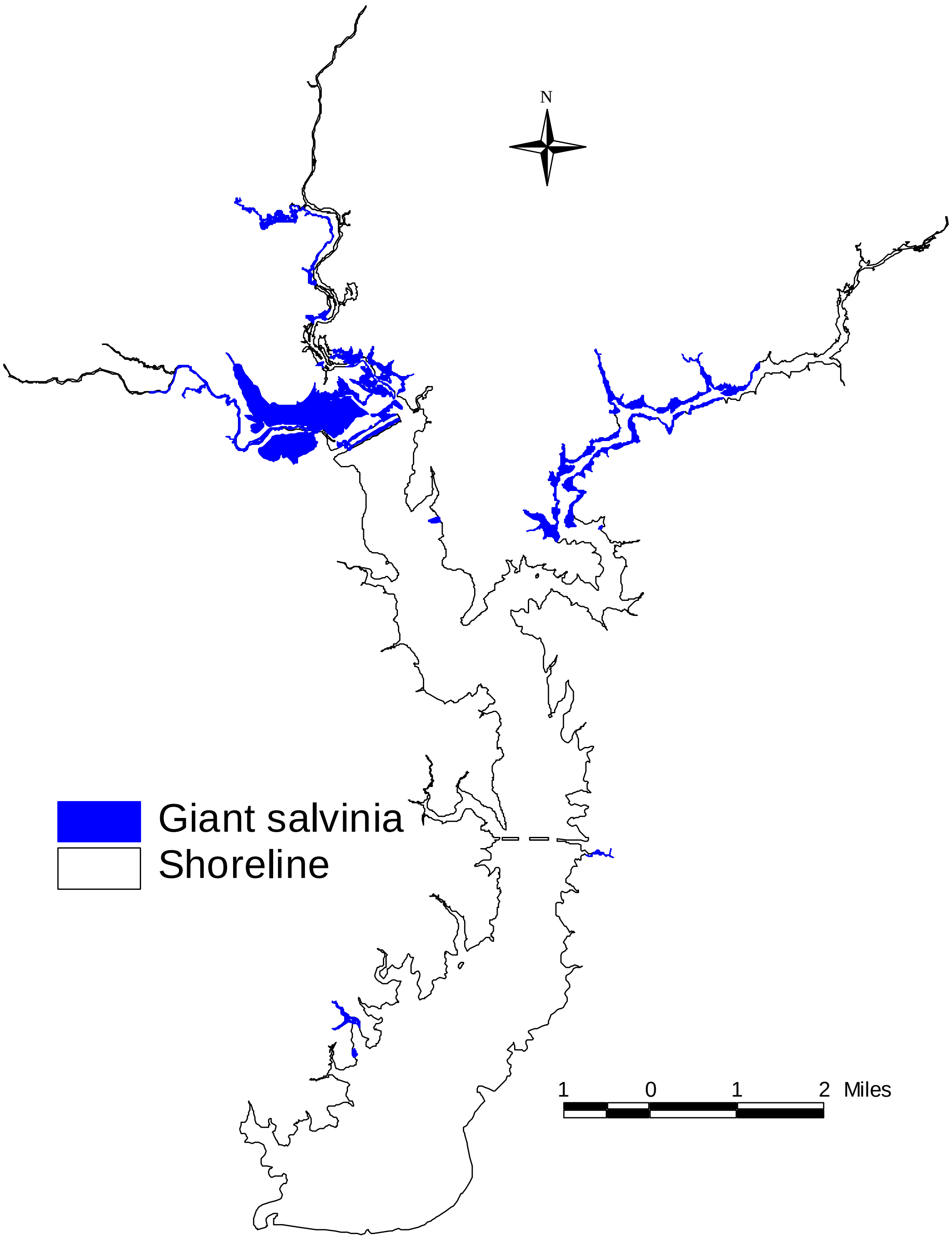


Native submerged and floating-leaved vegetation map for Lake Texana, Texas, 2014.

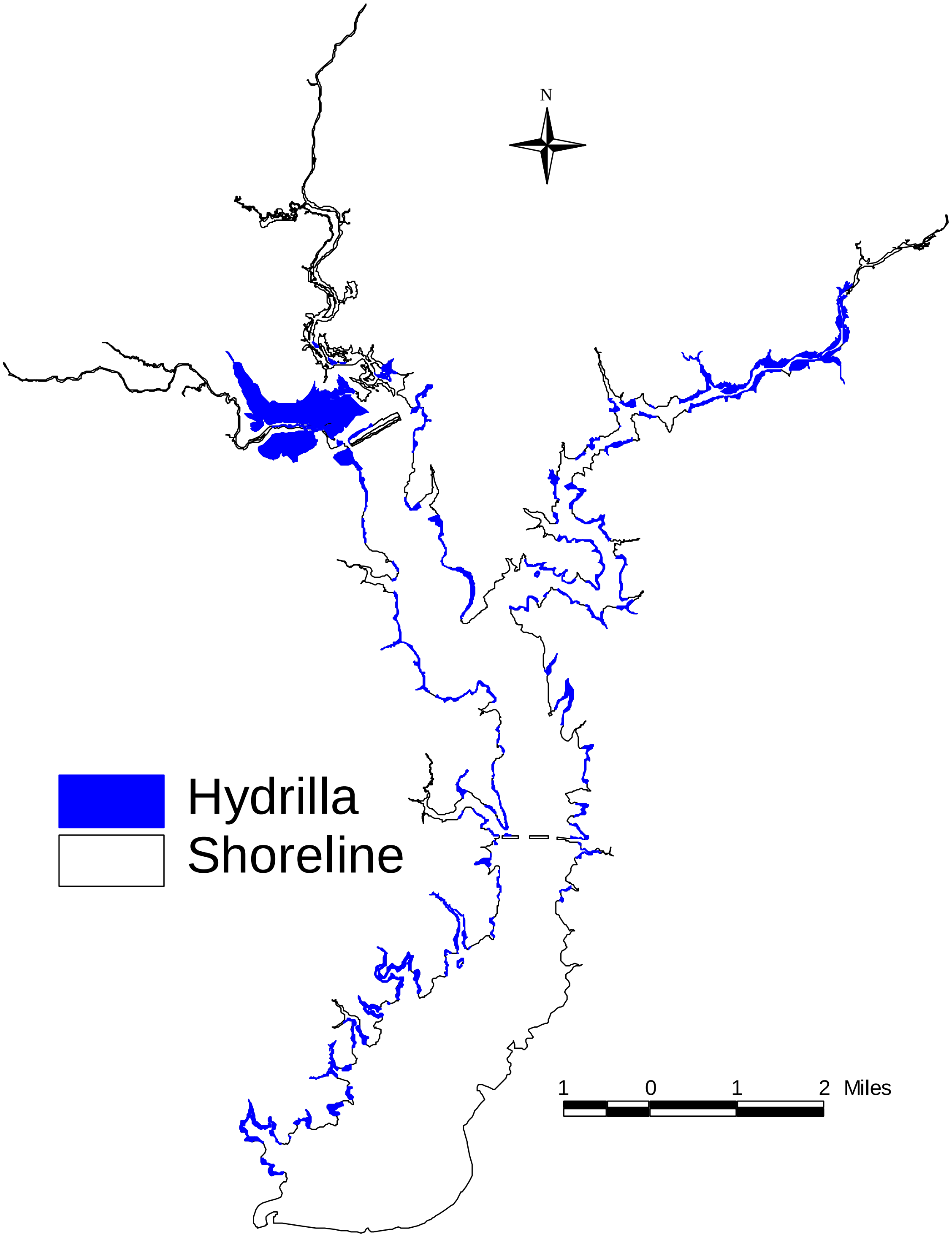
APPENDIX D



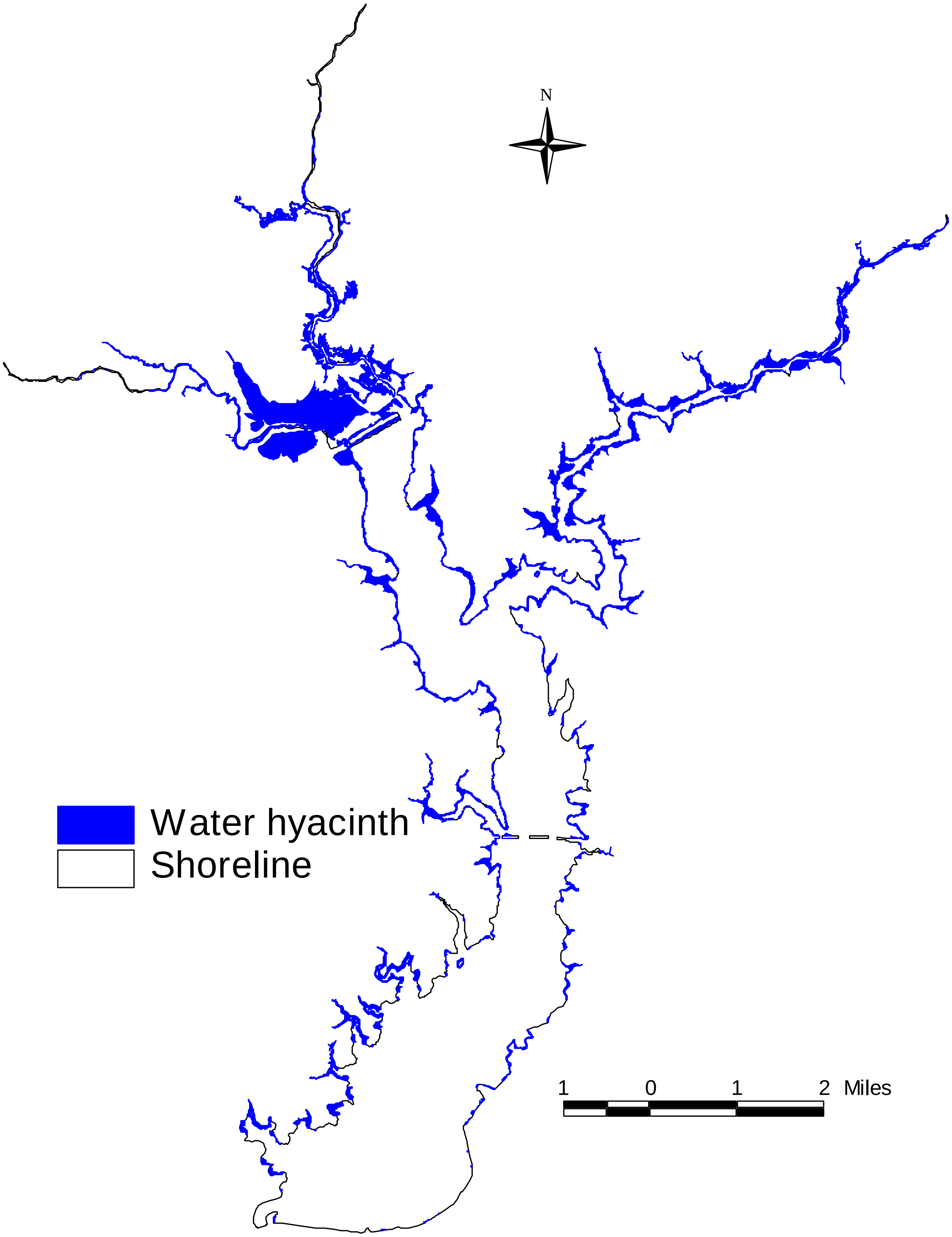
Alligator weed map for Lake Texana, Texas, 2014.



Giant salvinia map for Lake Texana, Texas, 2014.



Hydrilla map for Lake Texana, Texas, 2014.



Water hyacinth map for Lake Texana, Texas, 2014.

APPENDIX E

Objective-Based Sampling Plan for Lake Texana

2016 – 2019

Sport fish, forage fish, and other important fishes

Sport fish in Lake Texana include Blue, Channel, and Flathead catfishes, White Bass, Largemouth Bass, and Black and White crappies. Important forage species include Gizzard and Threadfin shads, and Bluegill.

Negligible Fisheries

Negligible fisheries are non-existent in Lake Texana.

Survey objectives, fisheries metrics, and sampling objectives

Blue Catfish: Blue Catfish are the predominant catfish species in the reservoir and present in good numbers. Annual gill net total CPUE since 1987 has averaged 11.0/nn (N = 11; standard deviation = 6.2; range: 2.7 – 23.1/nn) and mean stock size CPUE is 4.9/nn (N = 11; standard deviation = 2.5; range: 1.7 – 8.1/nn). Further, the reservoir typically produces good numbers of quality-sized (≥ 20 in) fish available to anglers. Blue Catfish have always been managed with the statewide 12-inch minimum length limit and 25 fish daily bag. Trend data on CPUE, size structure, and body condition were collected at least biennially from 1993 – 2003 and every four years since with spring gill netting. Currently, the population appears to be in good shape, and anglers are anecdotally satisfied with the fishing. Collection of trend data with spring gill netting every four years will allow for determination of large-scale changes in population dynamics that may warrant further investigation and more intensive sampling. A minimum of 10 randomly selected gill net sites will be sampled in 2019. Additional sampling will be conducted in sets of five gill nets at random sites until 50 stock-size fish are collected and the RSE of CPUE-S is ≤ 25.

Channel Catfish: Channel Catfish are present in Lake Texana but abundance appears to be low (average gill net CPUE = 0.5/nn; N = 11; standard deviation = 0.3; range: 0.1 – 0.9/nn). Channel Catfish have always been managed under the statewide 12-inch MLL and 25 fish daily bag. Channel Catfish have been surveyed using gill nets at least biennially from 1993 – 2003 and every four years since with spring gill netting. However, minimal conclusions regarding the trend data on CPUE, size structure, and body condition of Channel Catfish can be made due to few fish collected by gill net sampling. Exploratory use of baited hoop nets will be conducted in 2018 to determine utility of this sampling gear and to determine if this fishery is negligible. A minimum of 12, randomly selected 3-night tandem hoop net sets will be deployed to document initial utility of the gear to collect Channel Catfish.

Flathead Catfish: Flathead Catfish are present in the reservoir in low abundance. Since 1987, the mean CPUE is 0.2/nn (N = 11; standard deviation = 0.17; range: 0.0/nn – 0.6/nn). Exploratory use low-frequency electrofishing will be conducted to determine if the Flathead Catfish fishery is negligible and also for utility for use as alternative gear for collecting trend data for this species. Twenty randomly selected 3-minute LF electrofishing stations (effort will continue until fish no longer surface or all fish submerge) will be sampled in 2018 to determine utility of low-frequency electrofising for collecting Flathead Catfish.

White Bass: White Bass are present in the reservoir, but relative abundance estimates are variable from sample to sample and typically are low which may be dependent on sampling sites. The mean historical catch rate for White Bass is 1.8/nn (N = 11; standard deviation = 2.4; range = 0.1 – 7.5/nn). Anecdotal information suggests a popular harvest-oriented White Bass fishery does exist at the reservoir. White Bass will continue to be sampled with spring gill nets to monitor presence/absence according to objectives described for Blue Catfish. No additional effort, beyond what will be done for Blue Catfish, will occur.

Largemouth Bass: Historically, relative abundance of Largemouth Bass was low, however LMB have been present in the reservoir in decent numbers in recent years. The mean historical total CPUE for Largemouth Bass is 20.2/h (N = 9; standard deviation = 17.2; range: 2.0 – 52.7/h) and mean stock-size CPUE is 10.3/h (N = 9; standard deviation = 8.4; range: 0.5 – 29.3/h). Largemouth Bass have always been managed with the statewide 14-inch minimum length limit and 5 fish daily bag. Trend data on CPUE, size structure, and body condition has been collected at a minimum every four years since 1993 with fall electrofishing with the last survey occurring in 2014. The population appears to be doing well evidenced by the two highest catch rates observed on the reservoir in 2010 (CPUE = 40.0/h) and 2014 (CPUE = 52.7/h). Collection of trend data with fall electrofishing every four years will allow for determination of large-scale changes in population dynamics that may warrant further investigation and more intensive sampling. A minimum of 18 randomly selected electrofishing sites will be sampled in 2018. Sampling will continue at additional random sites until 50 stock-size fish are collected and the RSE of CPUE-S is ≤ 25.

White Crappie: White Crappie are present in the reservoir in good numbers (historical mean CPUE = 12.8/nn; N = 8; standard deviation = 10.3; range: 2.6 – 35.4/nn). Based on anecdotal reports and the number of crappie anglers observed during routine surveys, White Crappie represent an important component to the overall sport fishery at the reservoir. White Crappie have always been managed with the statewide 10 inch MLL and 25 fish daily bag. Trend data on CPUE, size structure, and body condition has been collected at a minimum every four years since 1993 with fall trap netting with the last survey occurring in 2014. Collection of trend data with fall trap netting every four years will allow for determination of large-scale changes in population dynamics that may warrant further investigation and more intensive sampling. A minimum of 10 randomly selected sites will be sampled in 2019. Additional sampling will be conducted in sets of five trap nets at random sites until 50 stock-size fish are collected. Achieving a reasonable RSE (<25) will likely be unattainable with practical sampling effort. Therefore, only large changes in relative abundance can be documented with CPUE.

Gizzard and Threadfin Shad and Bluegill: Gizzard and Threadfin shads and Bluegill are the primary forage at Lake Texana. Like Largemouth Bass, trend data on CPUE and size structure of Gizzard Shad and Bluegill have been collected at a minimum every four years since 1993 with fall electrofishing. Continuation of sampling, as per Largemouth Bass above, will allow for monitoring of large-scale changes in Gizzard Shad and Bluegill relative abundance and size structure. Sampling effort based on achieving sampling objectives for Largemouth Bass will result in sufficient numbers for size structure estimation (Gizzard Shad IOV; 50 fish minimum and Bluegill PSD; 50 fish minimum at 18 randomly selected 5-minute stations with 90% confidence) and relative abundance estimates (Bluegill CPUE-Total; RSE ≤ 25, anticipated effort is 18 stations based on historical data). The RSE ≤ 25 objective will only be set for Bluegill as Gizzard Shad CPUE-Total RSE’s fluctuate substantially from year to year and sampling has achieved RSE ≤ 25 only once in 9 samples.